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FIG. 1

```
<!DOCTYPE payInfo [
  <!ELEMENT payInfo (creditCard?, amount+)>
  <!ELEMENT creditCard (number, name, address)>
  <!ATTLIST creditCard limit CDATA #IMPLIED>
  <!ELEMENT number (#PCDATA)>
  <!ELEMENT name (#PCDATA)>
  <!ELEMENT address (#PCDATA)>
  <!ELEMENT amount (#PCDATA)>
]>
```
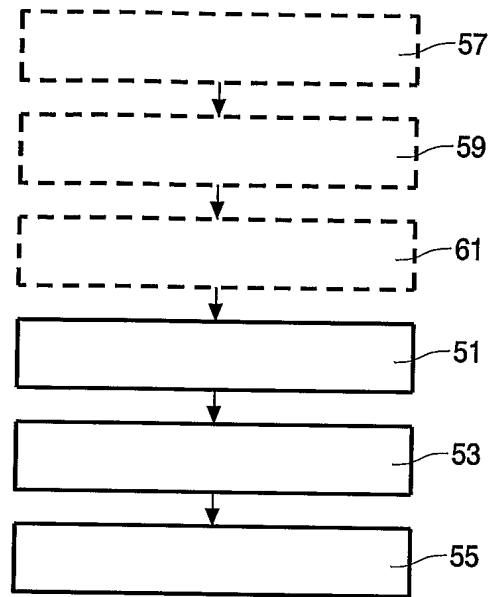
FIG. 2a

An XML DTD example-dtd1

```
<pay_Info>
  <creditCard limit=1000>
    <number> 123456789 </number>
    <name> Alice </name>
    <address> Twente 7500 AE, Netherlands </address>
  </creditCard>
  <amount 100.0 </amount>
</pay_Info>
```
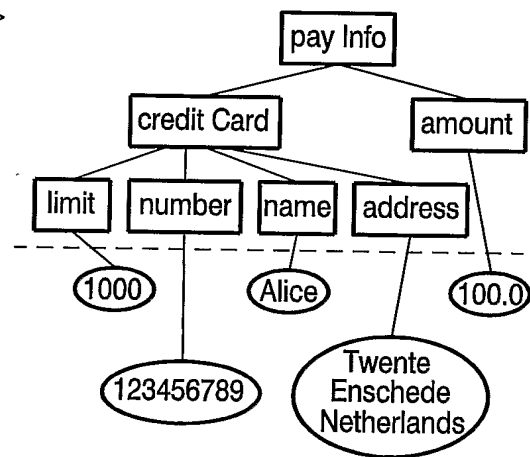
FIG. 2b

An XML document example-doc1 that conforms to dtd1

FIG. 2c

A graphical representation of the DOM
tree structure for dtd 1 and doc 1

Path Length	Path
2	$P_1 = $ (payInfo/creditCard/limit) $P_2 = $ (payInfo/creditCard/number) $P_3 = $ (payInfo/creditCard/name) $P_4 = $ (payInfo/creditCard/address)
1	$P_5 = $ (payInfo/creditCard) $P_6 = $ (payInfo/amount) $P_7 = $ (creditCard/limit) $P_8 = $ (creditCard/number) $P_9 = $ (creditCard/name) $P_{10} = $ (creditCard/address)
0	$P_{11} = $ (payInfo) $P_{12} = $ (creditCard) $P_{13} = $ (amount) $P_{14} = $ (limit) $P_{15} = $ (number) $P_{16} = $ (name) $P_{17} = $ (address)

FIG. 3

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Identifier of document that contains node(s) hashed into the bucket

Identifier of mapped content/value

0 → doc1, 0 | doc1, 1 |

1 → doc1, 7 | doc1, 10 |

2 → doc1, 25 |

3 → | |

Hash Address
DOCHashTable$_{dtd1}$ for dtd1
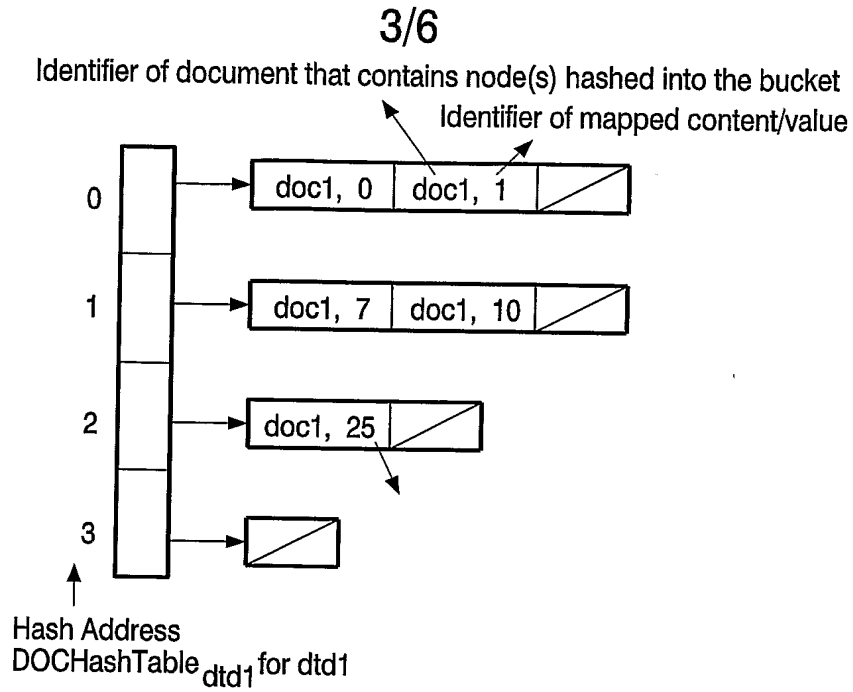
FIG. 4

(Element/Attribute c_{name}, Content/Value c_{val})	HashFunc(c_{name})	MapFunc(c_{val})
c_1 = (limit, 1000)	0	1
c_2 = (number, 123456789)	1	10
c_3 = (name, "Alice")	0	0
c_4 = (address, "Twente, Enschede, Netherlands")	2	25
c_5 = (amount, 100.0)	1	7

FIG. 5

FIG. 6

```
<!DOCTYPE payInfo [
  <!ELEMENT order (person, invoice)>
  <!ELEMENT person (name, gender)>
  <!ELEMENT name (#PCDATA)>
  <!ELEMENT gender (#PCDATA)>
  <!ELEMENT invoice (dueDate)>
  <!ELEMENT dueDate (#PCDATA)>
]>
```
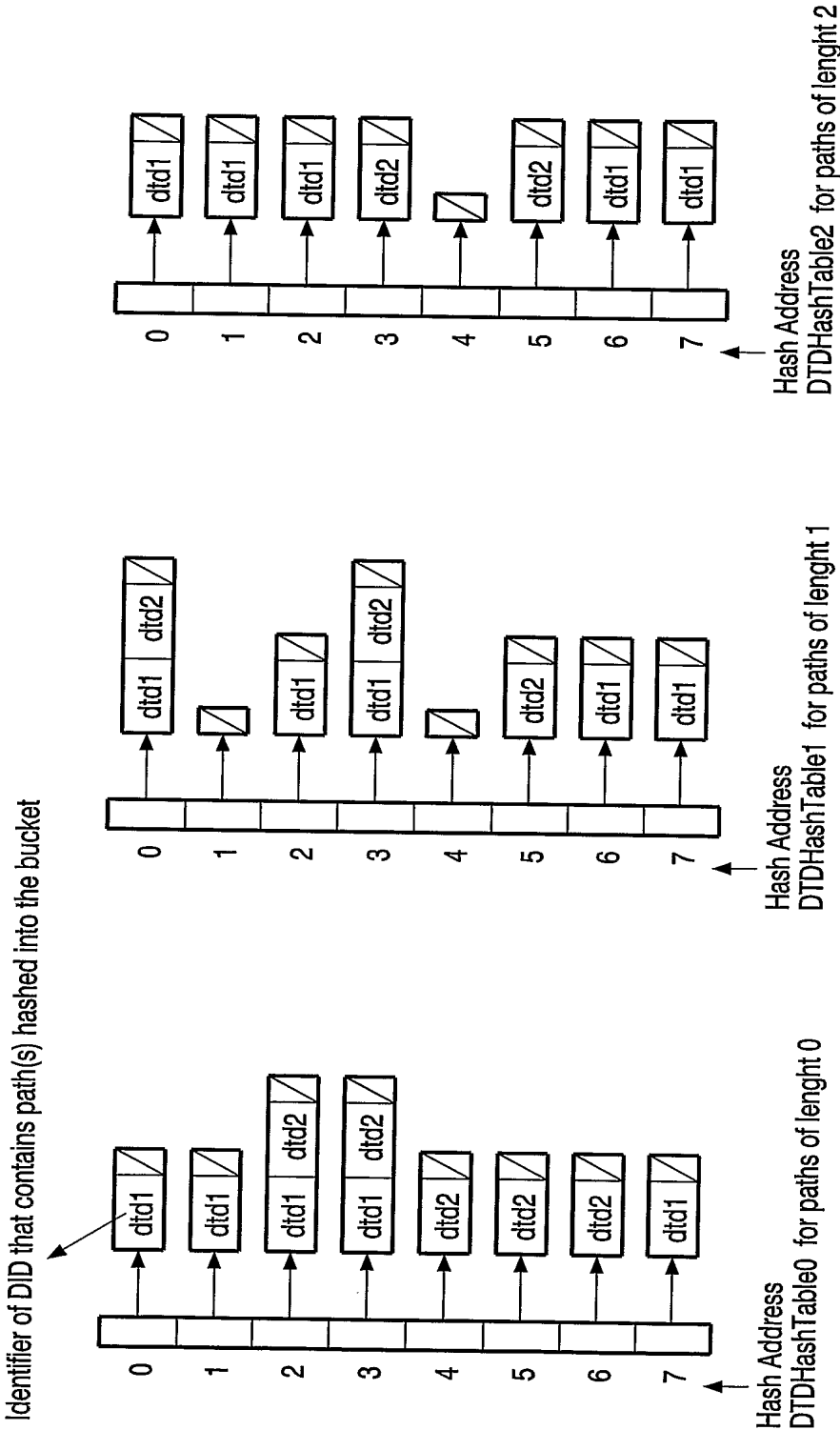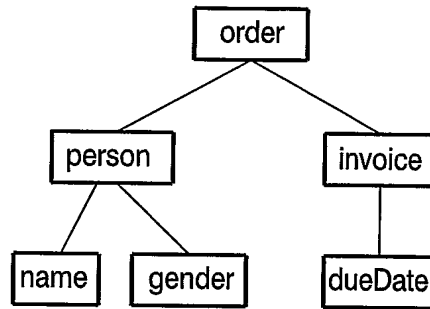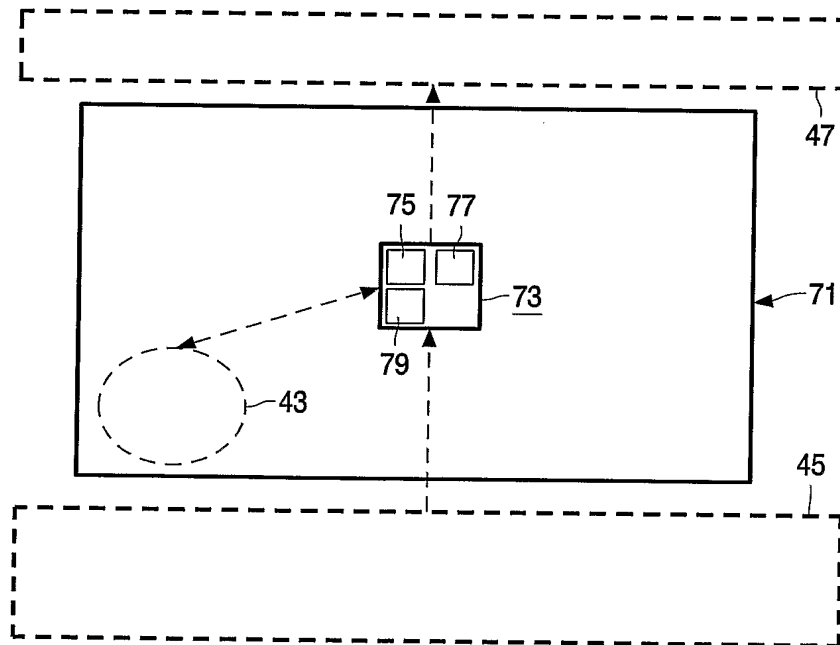
FIG. 7a

Another DTD example-dtd2

FIG. 7b

A tree structure for dtd2

FIG. 8

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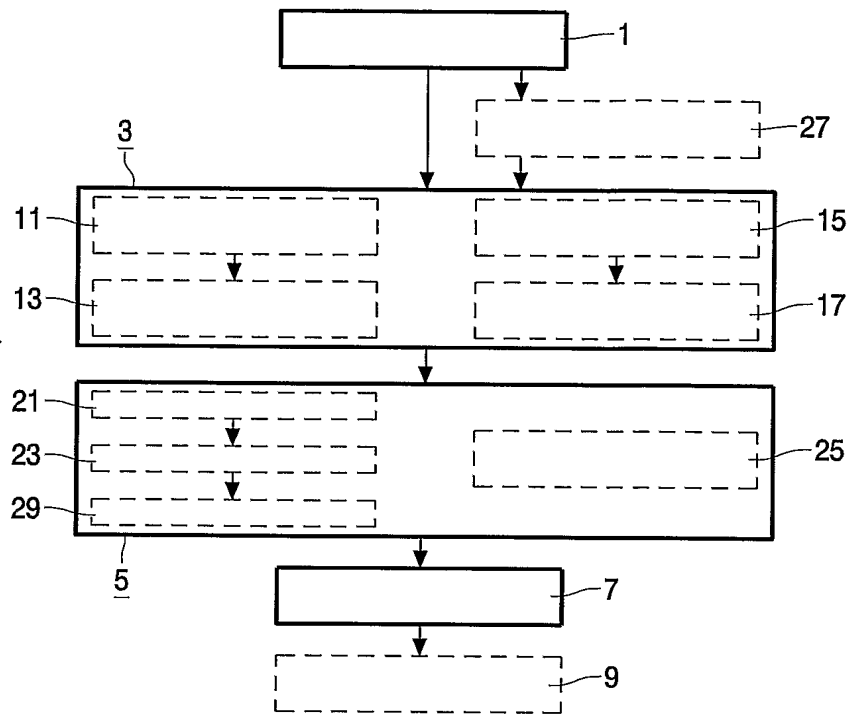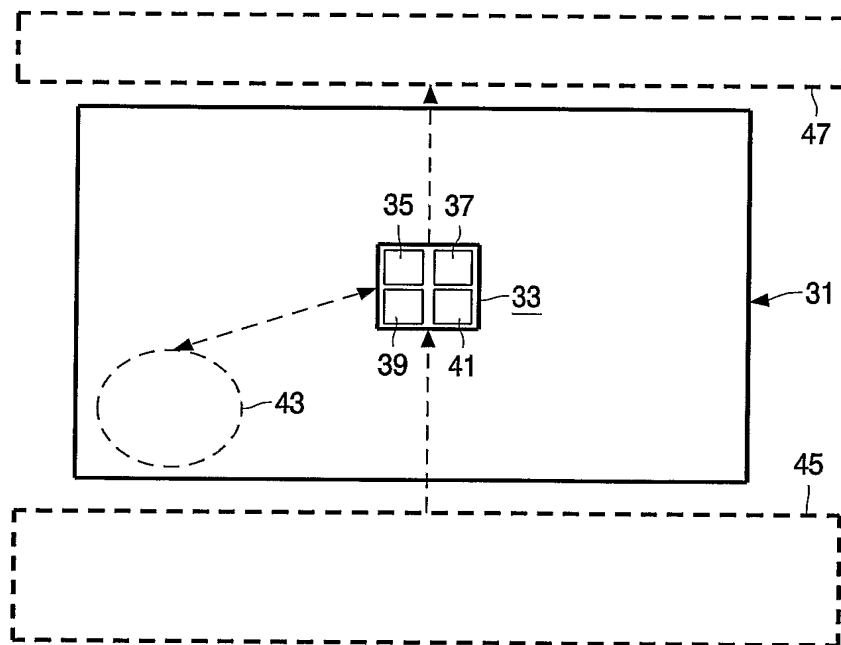

FIG. 9

FIG. 10